ASSIGNMENT #6
201-009-50
SOLUTIONS

P. 91 #16

we want $f(5)$

we have $f(1)=2$ & $f(-5)=2$

these are points $(1,2)$ & $(-5,2)$

$y = mx+b \qquad m = \dfrac{(2-2)}{1-(-5)} = \dfrac{0}{6} = 0$

so the line is

$$y = 0x + b$$

$\Rightarrow y = b$ sub in $(1,2)$

$$2 = 0(1)+b$$

$$b=2$$

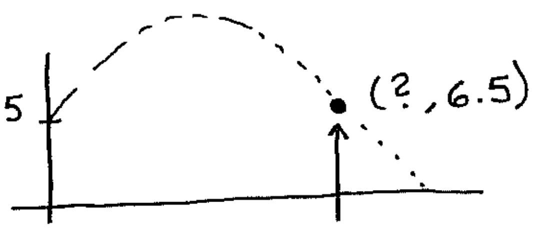
The line is $y=2$

so $\boxed{f(5)=2}$

P. 103 #13

(a) $h = -8.5x^2 + 25x + 6.5$

The starting height of the ball is when $x=0$; $h = 6.5$



We want to know x when $h=6.5$ again

$$6.5 = -8.5x^2 + 25x + 6.5$$

$$0 = -8.5x^2 + 25x$$

QUADRATIC FORMULA:

$$x = \frac{-25 \pm \sqrt{25^2 - 4(-8.5)(0)}}{2(-8.5)}$$

$$= \frac{-25 \pm 25}{-17}$$

so $x = 0$ OR $x = \dfrac{-50}{-17} \approx \boxed{2.94 \text{ s}}$

(b) THE BALL HITS THE ground WHEN $h=0$

$$0 = -8.5x^2 + 25x + 6.5$$

$$x = \frac{-25 \pm \sqrt{25^2 - 4(-8.5)(6.5)}}{2(-8.5)}$$

$$= \frac{-25 \pm \sqrt{846}}{-17}$$

$x = -0.24$ OR $x = 3.18$

we disregard Negative solution

$$\boxed{x = 3.18 \text{ s}}$$

(c) We WANT x-coordinate OF vertex

$$x = \frac{-b}{2a} = \frac{-25}{2(-8.5)} = 1.47$$

$$\boxed{x = 1.47 \text{ s}}$$

(d) We WANT h-coordinate OF vertex

$$h = -8.5(1.47)^2 + 25(1.47) + 6.5$$

$$= 24.88$$

So $\boxed{h = 24.88 \text{ ft}}$ is MAX height

#14 $f(t) = -4t^2 + 2t + 7$

(a) we WANT vertex

$$t = \frac{-b}{2a} = \frac{-2}{2(-4)} = \frac{1}{4}$$

Height At $t = 1/4$ s

$$f(1/4) = -4(1/4)^2 + 2(1/4) + 7$$

$$= -\frac{1}{4} + \frac{1}{2} + 7 = -\frac{1}{4} + \frac{2}{4} + \frac{28}{4} = \frac{29}{4}$$

Height is $29/4 = \boxed{7.25 \text{ m}}$.

(b) He hits water at $h=0$

$$0 = -4t^2+2t+7$$

$$t = \frac{-2 \pm \sqrt{2^2 - 4(-4)7}}{2(-4)}$$

$$= \frac{-2 \pm \sqrt{116}}{-8} \qquad t = -1.09 \quad \text{or } t = 1.6$$

we disregard negative time; $\boxed{t = 1.6\text{ s}}$

#16 we know $n+m=20$

we want to minimize

$$SS = n^2+m^2 \quad \text{(sum of the squares of } n \,\&\, m)$$

since $n+m=20$

$$m = 20-n$$

substitute into SS

$$SS = n^2+(20-n)^2$$

$$= n^2+400-40n+n^2$$

$$SS = 2N^2-40N+400$$

The minimum SS will occur at vertex

$$n = \frac{-b}{2a} = \frac{40}{2(2)} = 10$$

so $\boxed{n=10}$ forcing $\boxed{m=10}$.

#19 we have an equation of the form

$$f(x) = ax^2+bx+c$$

sub in the 3 points

$$0 = a(0)^2+b(0)+c \qquad 9 = a(1)^2+b(1)+c$$

$$0 = c \quad (1) \qquad 9 = a+b \quad (2)$$

$$16 = a(2)^2+b(2)+c$$

$$16 = 4a+2b \quad (3)$$

we know $c=0$ we must find a, b using

$$9 = a+b$$

$$16 = 4a+2b$$

FROM $9 = a + b$

$a = 9 - b$

Substitute this a value INTO

$16 = 4a + 2b$

$16 = 4(9 - b) + 2b$

$16 = 36 - 4b + 2b$

$-20 = -2b$

$b = 10$ so $a = 9 - 10 = -1$

THE EQUATION IS THUS $\boxed{f(x) = -x^2 + 10x}$

20

(a) we have the points $(0,4)$, $(1,28)$ & $(2,20)$

& $f(x) = ax^2 + bx + c$

$4 = a(0)^2 + b(0) + c$

$c = 4$ (1)

$28 = a(1)^2 + b(1) + c$

$28 = a + b + 4$

$24 = a + b$ (2)

$20 = a(2)^2 + b(2) + c$

$20 = 4a + 2b + 4$

$16 = 4a + 2b$ (3)

FROM (2) we have $a = 24 - b$

sub INTO (3) $16 = 4(24 - b) + 2b$

$16 = 96 - 4b + 2b$

$-80 = -2b$

$b = 40$ $a = 24 - 40 = -16$

So $\boxed{f(x) = -16x^2 + 40b + 4}$

(b) vertex $x = \frac{-40}{2(-16)} = \frac{5}{4}$

$h(5/4) = -16\left(\frac{5}{4}\right)^2 + 40\left(\frac{5}{4}\right) + 4$

$= -25 + 50 + 4 = 29$

MAX Height $\boxed{29 \text{ ft at } 1.25 \text{ S}}$

(c) $h(t) = 0$ $0 = -16x^2 + 40x + 4$

USE QUADRATIC FORMULA & Find $x = -0.09$

& $x = 2.6$. SO SOLUTION MUST be $\boxed{x = 2.6 \text{ S}}$